DETAILED ACTION

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, step (b), there is no antecedent basis for "the product stream".

Claim 18 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. In the independent claim 1, the claim is drawn to a process for converting $SiCl_4$ to $HSiCl_3$, however, in claim 18, the step of *using* the $HSiCl_3$ to produce another different product, such as alkoxysilanes, organochlorosilanes, monosilane, silicon, etc., does not further limit the subject matter of claim 1, which is a process of *producing* $HSiCl_3$ because $HSiCl_3$ is no longer the final product in claim 8.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 57-118017 in view of Yamanaka et al (6,653,212), further in view of Rodgers (3,933,985).

JP '017 discloses a process for producing $SiHCl_3$ in high yield. In the process, $SiCl_4$ is mixed with H_2 in 4:1 to 1:10 molar ratio and introduced into the first reactor B, and by electrifying a graphite resistance 1, the interior of the reactor B is heated to 500-1,300°C to produce $SiHCl_3$ as well as HCl by-product in the presence of catalyst 9 (note English abstract). In JP '017, any unreacted reactants can be transferred to the second reactor to further produce $SiHCl_3$. It would have been obvious to one skilled in the art to recycle any excess reactants in order to minimize cost.

The $SiCl_4$ to H_2 ratio as disclosed in JP '017 overlaps the claimed range. With respect to the encompassing and overlapping ranges previously discussed, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time of invention to select the portion of the prior art's range which is within the range of the applicants' claims because it has been held prima facie case of obviousness to select a value in a known range by optimization for the results. *In re Boesch*, 205 USPQ 215. Additionally, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time invention was made to have selected the overlapping portion

of the range disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

For the pressure, space velocity for the reaction, it would have been obvious to one of ordinary skill in the art to optimize these conditions through routine experimentation in order to obtain the best results.

For the construction material for the reactor of JP ‘017, it would have been within the skill of the artisan to select a construction material for the reactor that can withstand the reaction conditions.

The differences are JP ‘017 does not disclose (1) the use of a metal heating element (the heating element in JP ‘017 is a graphite resistance) and (2) the fractionating or at least condensing the product mixture (step (a)) or passing the product stream to a direct further use (step (b)).

For difference (1), Yamanaka ‘212 discloses a thin film forming apparatus comprising a vacuum chamber, a substrate, a thermal catalyst, and a heating means for heating the thermal catalyst, wherein a gas introduction system for introducing a gas is connected to the vacuum chamber and wherein the gas is fed from the gas introduction system into the vacuum chamber to form a thin film on a surface of the substrate by utilizing a thermal decomposition reaction and a catalytic reaction by the thermal catalyst, the gas introduction system introduces a carrier gas containing hydrogen and a material gas for forming the thin film on the substrate, and the apparatus comprises a means for raising a concentration of the material gas in the vacuum chamber in the middle of the formation of the thin film on the substrate (note claim 1).

The thermal catalyst contains at least one type of material selected from a group consisting of tungsten, tungsten containing thoria, platinum, molybdenum, palladium, tantalum, metal deposited ceramics, silicon, alumina, silicon carbide, refractory metals (tungsten, tantalum, tungsten containing thoria, molybdenum, titanium, etc.) coated with silicon carbide or ceramics or conductive nitride films, silicon nitride or oxide, conductive metal nitrides (tungsten nitride, titanium nitride, molybdenum nitride, tantalum nitride, etc.), boronitride (BN), and silicide (note claim 24). The "at least one" fairly suggests a combination of two of more of the above listed compounds can be used, such as an alloy of more than 2 metals, etc. The thermal catalyst is preferred to be a wire made of tungsten, palladium, tantalum or molybdenum (note column 32, lines 63-65). The thermal catalyst 5 is not limited to one formed into a coil as shown in Figures 1-3. It is also possible to form it into a grid as shown in FIG. 6. The grid-like thermal catalyst is formed by for example assembling a plurality of wires having predetermined lengths in a grid and joining assembly portions of the wires by welding or the like. Further, it is also possible to form the thermal catalyst by winding a wire, coil, or the like of the thermal catalyst one or more times around a high heat resistant insulator such as ceramics, and quartz glass. Alternatively, it is also possible to press it to a flat metal plate to form the grid (note paragraph bridging column 43-44). The power supply in the present example is a DC power supply or an AC power supply or a power supply wherein the AC is superposed on the DC and is selected in accordance with the situation. By adjusting the voltage and/or current of the power supply, it becomes possible to adjust the temperature of the thermal catalysts (note column 45, lines 1-10).

Yamanaka '212 also discloses that the apparatus can be used to produce a film of Si and Poly-Si, produced from SiH_4, $SiHCl_3$, $SiCl_4$, etc. (note column 48, lines 52-54).

Thus, Yamanaka '212 fairly teaches that the thermal catalyst can be safely used in an atmosphere containing $SiCl_4$, $SiHCl_3$ and H_2.

It should be noted that the instant claims now require "bringing a gaseous feed mixture comprising hydrogen and silicon tetrachloride into direct contact with at least one heating element of a resistance heating device", however, there is no requirement that the heating device does serve as a catalyst for the process. In any event, for the combined teaching of JP '017 and Yamanaka '212, when the thermal catalyst, which is made from the preferred metals, tungsten, palladium, tantalum or molybdenum, is used in the process of producing $SiHCl_3$, the thermal catalyst would inherently have the effect on the process as when the claimed heating element is used.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the thermal catalyst, as suggest by Yamanaka '212, for heating the reactor in the process of JP '017 because such thermal catalyst is used for same purpose in an analogous condition.

For difference (2), Rodgers '985 can be applied to teach that when $SiCl_4$ is used to produce Si (as desired in the process of Yamanaka '212), the reaction between $SiCl_4$ and hydrogen is too slow, so the $SiCl_4$ normally reacts with hydrogen to form $SiHCl_3$ first then the $SiHCl_3$ is subsequently converted to Si.

Thus, Rodgers '985 fairly suggests that when $SiCl_4$ is used as the starting reactant in Yamanaka '212, the thermal catalyst in Yamanaka '212 may serve as a

catalyst to promote the formation of $SiHCl_3$ from $SiCl_4$ first, before the $SiHCl_3$ is converted to Si film.

Rodgers '985 is also applied to teach that after the $SiHCl_3$ is formed, the $SiHCl_3$ is fed to a subsequent step to produce Si (note column 1, lines 34-40 and Figures 1-2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the $SiHCl_3$ produced in the process of JP '017 as the reactant to produce Si as suggested by Rodgers '985 because using a product from one reaction as reactant for another reaction is well within the skill of the artisan.

Applicant's arguments filed March 10, 2008 have been fully considered but they are not persuasive.

Applicants urge that claim 1 now requires an additional step of (a) fractionating or at least partially condensing the product mixture produced by the reaction induced by heating or (b) passing the product stream from said reaction as starting material to a direct further use.

Rodgers '985 is now further applied to suggest the step of using the $SiHCl_3$, produced in a previous step, as reactant in a subsequent step to produce Si, which is the same as step (b) in Applicants' claim 1.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ngoc-Yen M. Nguyen whose telephone number is (571) 272-1356. The examiner can normally be reached on Part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ngoc-Yen M. Nguyen/
Primary Examiner, Art Unit 1793

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June 11, 2008